REMARKS

Claim 1 has been amended to emphasize that air oxidation of the coalescent aid results in an increase in the glass transition temperature of a film of the composition when the film is cured in the presence of air. Support for the amendment may be found at page 10, lines 3 to 7 of the originally-filed application.

Claims 1-3, 5-6, 8-12, 14-56, 58-59, 62-65, 67-70, 72-75, 77-80, and 82-96 are pending. Claims 4, 7, 13, 57, 60, 61, 66, 71, 76, and 81 have been previously canceled.

I. Non-Obviousness Under 35 U.S.C. 103(a)

Reconsideration is requested of the rejection of claims 1-3, 5-6, 8-12, 14-56, 58-59, 62-65, 67-70, 72-75, 77-80, and 82-96 under 35 U.S.C. 103(a) as being unpatentable over Boege et al. For a *prima facie* case of obvious to be established, cited references must describe all the elements of the applicant's invention and suggest or provide a motivation to modify or combine the cited references in a manner that teaches or suggests all of the claim requirements. Furthermore, a reasonable expectation of success in the combination must be found in the prior art. MPEP §§ 2143-2143.03.

Claim 1 is directed to a film-forming composition comprising a continuous aqueous phase and a dispersed phase. The dispersed phase comprises (i) a particulate polymer or emulsified liquid prepolymer, and (ii) a coalescent aid comprising an ester derived from a fatty acid of an oil of plant or animal origin, the ester having the formula RCOOX wherein R is hydrocarbyl or substituted hydrocarbyl and comprises at least two unsaturated carbon-carbon bonds and X is $-C_2H_4OH$ (ethylene glycol), $-C_2H_4OC_2H_4OH$ (diethylene glycol), $-C_3H_6OH$ (propylene glycol), or $-C_3H_6OC_3H_6OH$ (dipropylene glycol). As described in the specification, air oxidation of the coalescent aid causes an increase in the glass transition temperature of a film of the composition when the film is cured in the presence of air.[1] To amplify this feature of the coalescent aid, claim 1 has been amended to recite, "...whereby air oxidation of the coalescent aid causes an increase in the glass transition temperature of a film of the composition when the film is cured in the presence of air."

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[1] See application, page 10, lines 3-9.

As the composition cures, a film is formed. Applicants have discovered that a coalescent aid that remains in the film will act as a plasticizer, keeping the glass transition temperature of the film low unless the coalescent aid has polyunsaturations. However, if polyunsaturations are present in the coalescent aid, air oxidation will cause the coalescent aid to oligomerize, resulting in the coalescent aid becoming more of a resin and less of a plasticizer, and increasing the glass transition temperature of the film.[2]

The applicants have further discovered that ethylene glycol, diethylene glycol, propylene glycol and dipropylene glycol esters, when combined with a fatty acid of claim 1 produce a superior coalescent aid due to their Hydrophilic Lipophilic Balance values (HLB values) and water solubility parameters. HLB values relate to a compound's miscibility in water, wherein higher HLB values correspond to greater water miscibility. Example 8 describes that the ethylene glycol soybean oil derivative (EG), diethylene glycol soybean oil derivative (DEG), propylene glycol soybean oil derivative (PG), dipropylene glycol soybean oil derivative (DPG) have HLB values ranging from 2.7-5.9. Compounds having HLB values of 3-6 have poor dispersion in water while compounds having HLB values of 1-4 have no dispersibility in water according to Blackley, Emulsion Polymerisation: Theory and Practice, p. 314 (1975).[3]

Example 8 further discloses that the solubility of EG, DEG, PG, and DPG range from 17.6 to 18.6 $(J/cm^3)^{½}$. The solubility range for the compounds is similar to the water solubility for polystyrene methyl methacrylate copolymer of 18.2 $(J/cm^3)^{½}$. The applicants disclose in Example 8 that "ideally for hydrophobic coalescent aids, a solubility parameter match [with a resin] will produce a better coalescent aid."

Fatty acid ester coalescent aids that have low HLB values and similar solubility parameters to that of the resin used in paint cause them to be predominantly dissolved in the dispersed phase and not in the continuous water phase. Thus, the applicants have discovered that ethylene glycol, diethylene glycol, propylene glycol, and dipropylene glycol esters ($-C_2H_4OH$, $-C_2H_4OC_2H_4OH$, $-C_3H_6OH$, or $-C_3H_6OC_3H_6OH$) of fatty acids are superior coalescent aids due to their relatively low HLB values and solubility parameters that are similar to the solubility of paint resins. Furthermore, the fatty acids incorporated in the coalescent aids, having at least two unsaturated carbon-carbon bonds, cause the coalescent aids to oligomerize and become more of a

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[2] *Id.*

[3] See Exhibit B of the Declaration of Michael R. Van De Mark and Nantana Jiratumnukul, filed February 17, 2003

resin and less of a plasticizer when cured in the presence of air, thereby increasing the glass transition temperature of the formed film.

In contrast to the superior coalescent aids discovered by the applicants, Boege et al. fail to disclose, suggest, or exemplify unsaturated fatty acid esters such as the ethylene glycol, diethylene glycol, propylene glycol, or dipropylene glycol esters of an oil of plant or animal origin required by claim 1. Rather, Boege et al. disclose that the plasticizers according to their invention reduce the glass transition temperature of styrene polymers. Moreover, Boege et al. specifically disclose that **"it is of particular importance that [the reduced glass transition temperature of the polymers is] permanent."**[4] Thus, Boege et al. teach away from the selection of fatty acids and esters required by claim 1 which increase the glass transition temperature of the resultant film as it cures.

Applicants further rebut any assertion of obviousness by demonstrating unexpected results disclosed in Example 8, as discussed above, of coalescent aids that possess relatively low HLB values and solubility parameters that are similar to the solubility of paint resins. "One way for a patent applicant to rebut a *prima facie* case of obviousness is to make a showing of 'unexpected results,' i.e., to show that the claimed invention exhibits some superior property or advantage that a person of ordinary skill in the art would have found surprising or unexpected."[5]

Applicants have demonstrated unexpected results by successfully demonstrating that the coalescent aids, as defined in claim 1, are superior due to their relatively low HLB values, solubility parameters, and unsaturations present in the fatty acid. These properties result in coalescent aids that have solubilities similar to paint resins, and furthermore, cause the coalescent aid to oligomerize and become more of a resin and less of a plasticizer when cured in the presence of air. Thus, the resultant coalescent aids are unexpectedly superior to the plasticizers disclosed by Boege et al., wherein Boege et al. emphasize that it is of particular importance that the reduced glass transition temperatures caused by the plasticizers are permanent.

In view of the foregoing, favorable reconsideration and allowance of all claims is requested.

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[4] Boege et al., U.S. Pat. No. 6,726,798, col. 6, lines 57-67.

[5] *In re Soni*, 54 F.3d 746, 750 (Fed. Cir. 1995).

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